Overview and Capabilities

August 2008

NovaSol

Fusing Light Into Information

ABOUT NOVASOL

- Founded in 1998 in Honolulu, Hawaii; mainland office in San Diego
- Engineering and technology strengths in ISR & Optical Communications
- Agile and strong employee team
  - more than half with advanced degrees/Ph.D.'s
- Employee owned
- Strong balance sheet
- Strong Congressional support as provider of relevant sustainable technology solutions

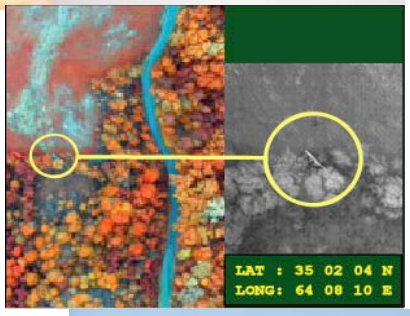
Awards

- Inc. 500 Recognized Top Performer (Dec 2004) out of 500,000 companies
- Winner, Pacific Business News "Best Small Business in Hawaii" (Nov 2005)

NOVASOL CAPABILITIES

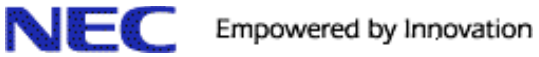
Optical Design Instrumentation and Processing Algorithms applied to:

- ISR Systems
  - HSI sensor development
  - Data fusion and exploitation
    - Algorithm development
    - Onboard, real-time
- Free-Space Optical Communications
  - High-bandwidth laser communication
  - LPI/LPD communications capability
  - Active tracking & stabilization
- System miniaturization
  - Unmanned Systems and man-portable applications



NOVASOL Provides End-to-End Solutions

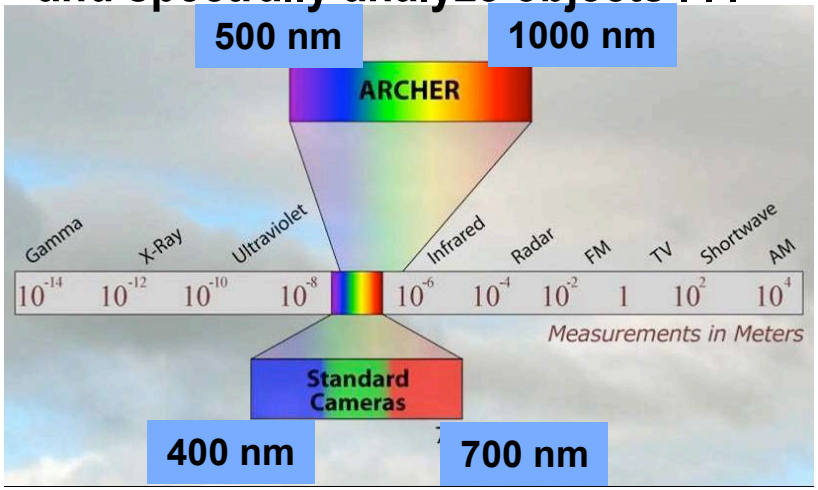
CUSTOMERS



NovaSol offers solutions, technology, and engineering development to DoD and industry

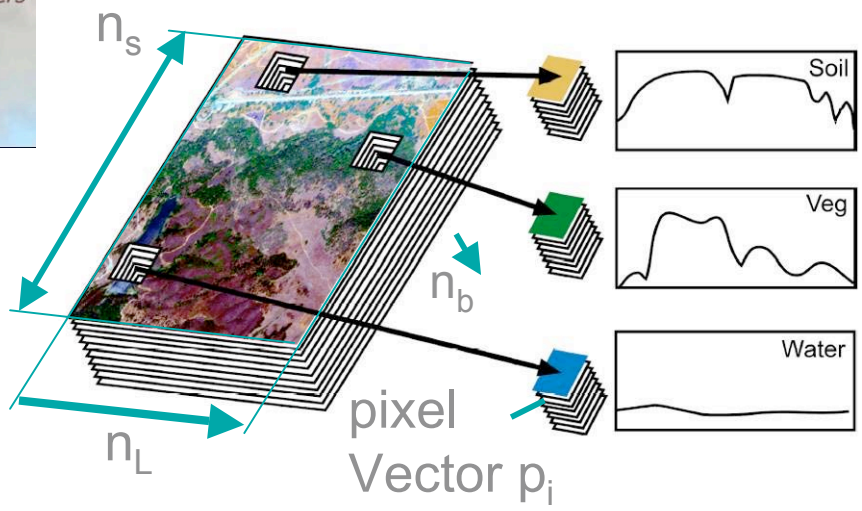
Hyperspectral Imaging

HSI systems see many bands of color and spectrally analyze objects . . .



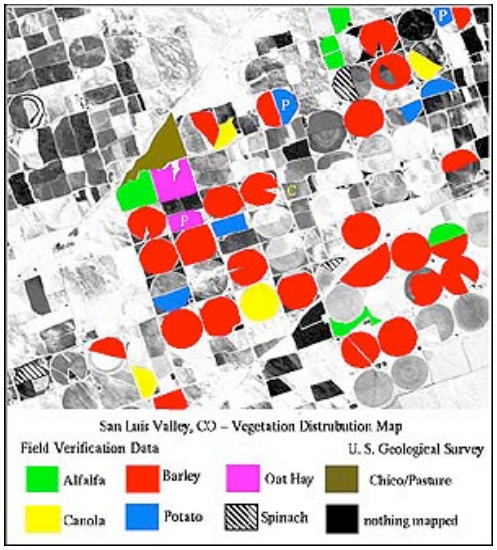
. . . while standard cameras see only broad bands of color

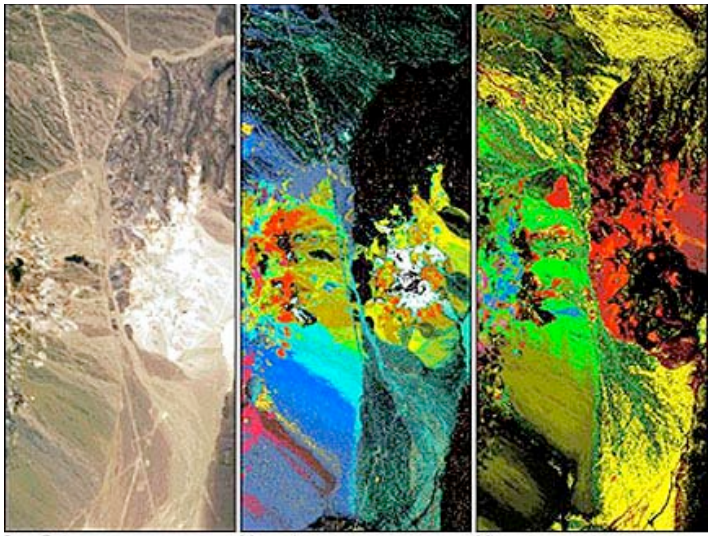
"spectral fingerprint"

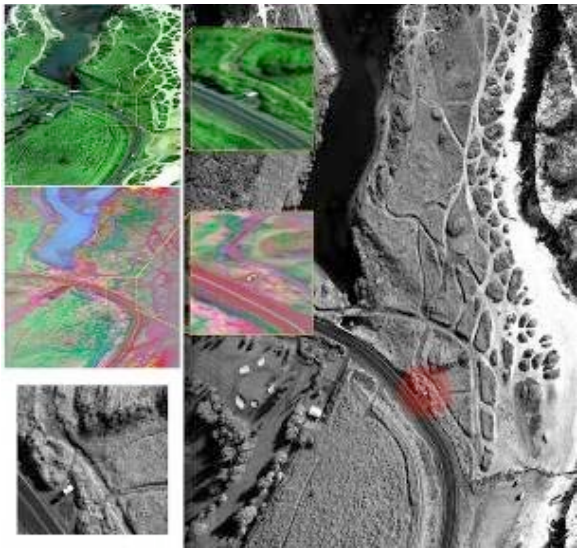


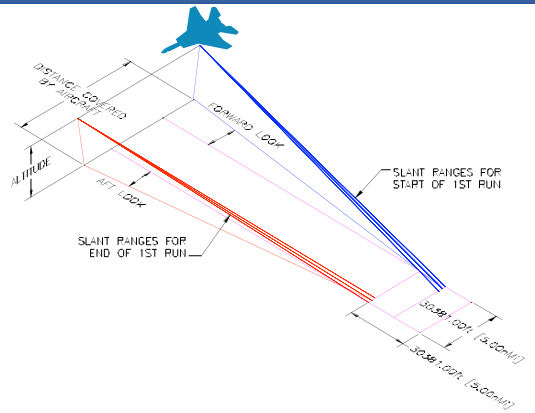
HYPERSPECTRAL APPLICATIONS

- Environmental Mapping
- Reef characterization
- Pollution detection/ID
- Invasive species detection/ID
- Agriculture characterization
- Mineral exploration
- Surveillance
- Military target detection

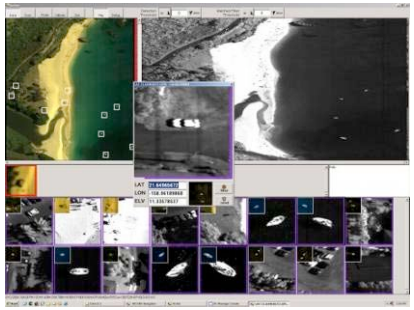








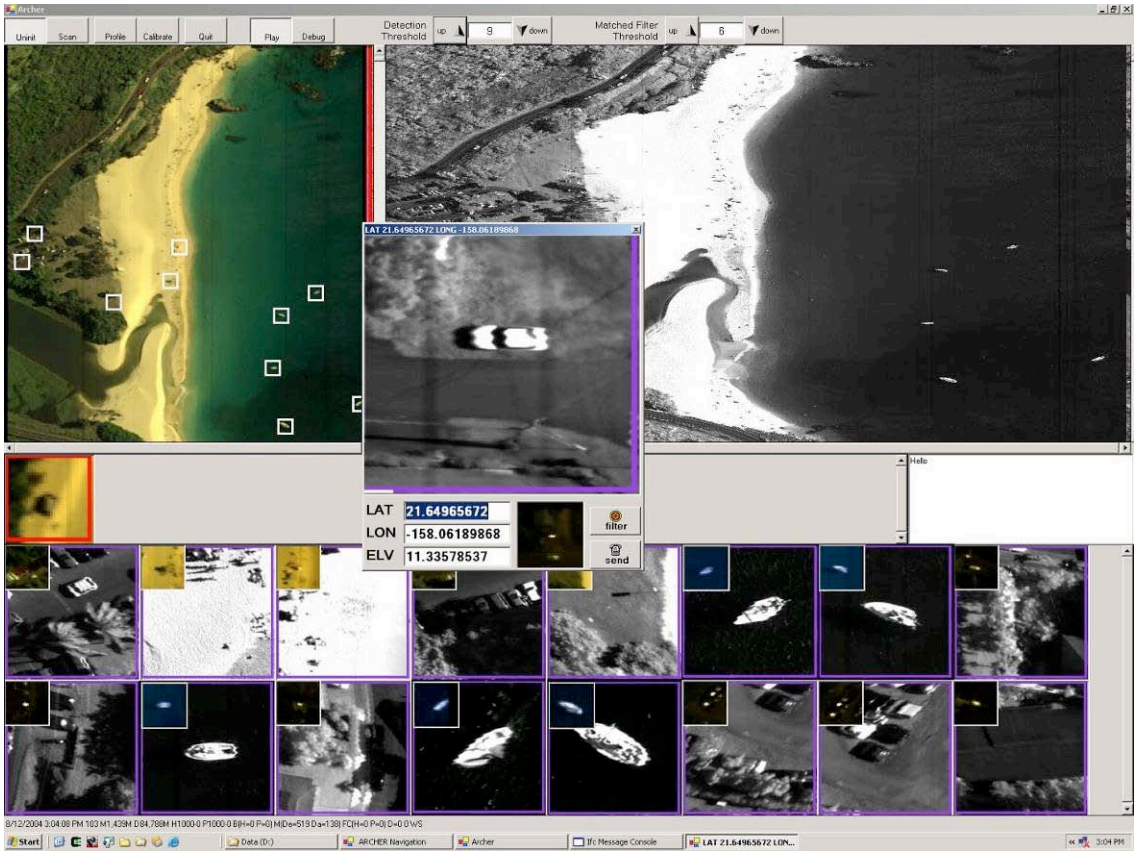
- F-18 **SHA**red **R**econnaissance **P**od (**SHARP**)
- **LO**ng **R**ange **O**blique **P**hotoreconnaissance (**LOROP**)
- Sensors – Processors – Data Exploitation Software - Integration



- **A**irborne **R**ealtime **C**ueing **H**yperspectral **E**nhanced **R**econ (LOROP)
- Production for U.S. Civil Air Patrol – Search and Rescue
- Sensors – Processors – Data Exploitation Software - Integration

ARCHER Operator Interface

- Data gathered during test at Hawaii North Shore, 2Q04
- 10 anomalies detected during real-time, coastal scan, five each on land and at sea
- High-resolution pan chips provide operator with real-time review of anomaly with fused geolocation data
- Images may be transmitted to ground for immediate review

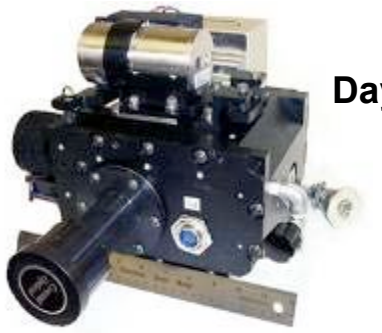


The ARCHER user interface was tailored for the operator and the homeland security mission

HSI SENSOR MINIATURIZATION

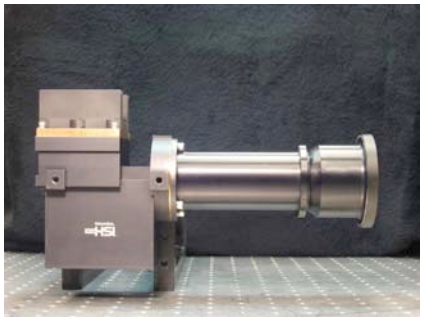
Visible to Near Infrared (VisNIR)
400 – 1100 nanometers
Daylight Nadir Spectral Imaging

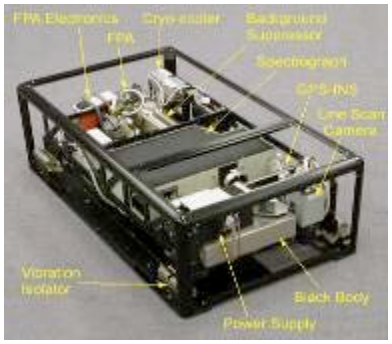
Field tested, multiple units delivered



Short Wave Infrared (SWIR)
1 to 2.5 microns
Daylight Nadir and Long Range Oblique Spectral Imaging

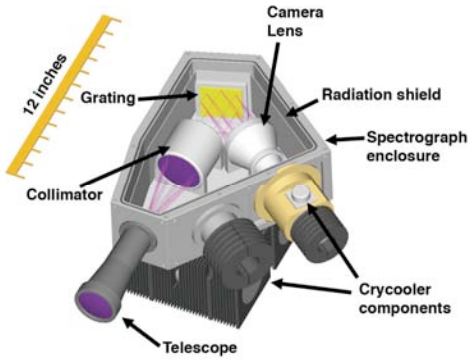
Currently undergoing test



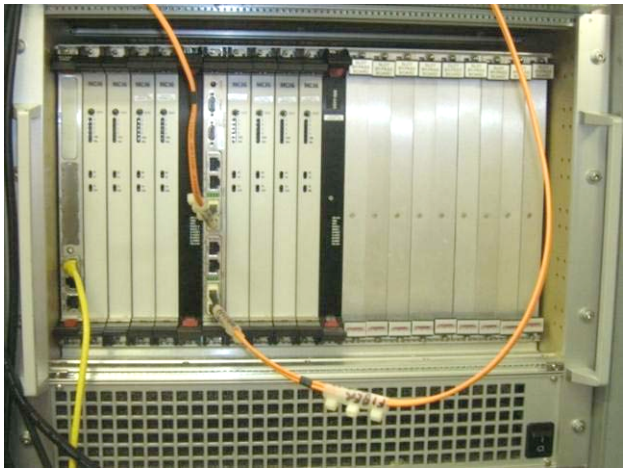


Long Wave Infrared (LWIR)
8 to 12 microns
Day and Night Thermal Spectral Imaging

In assembly

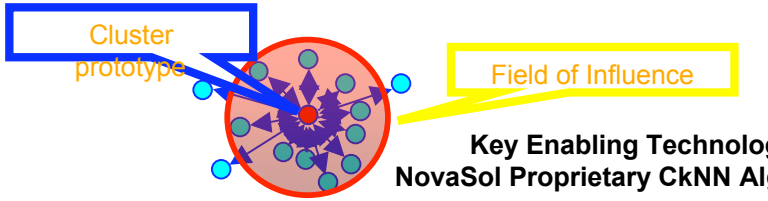


Fusion Processor Miniaturization



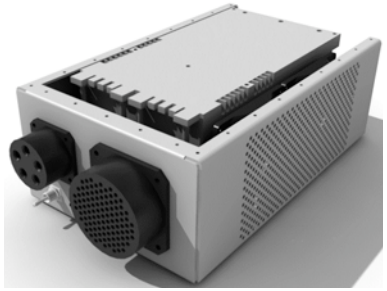
NRL Mercury Fusion Processor
19”W x 23”D x 15”H

	Acquire & Calibrate	Nav	Hard Disk	SSR X	SSM F	GSC	CD	SPD E
NRL Mercury				x	x	x	x	
NRL CHAMP				x	x			x
CASE	x	x	x	x	x			x



Key Enabling Technology:
NovaSol Proprietary CkNN Algorithms

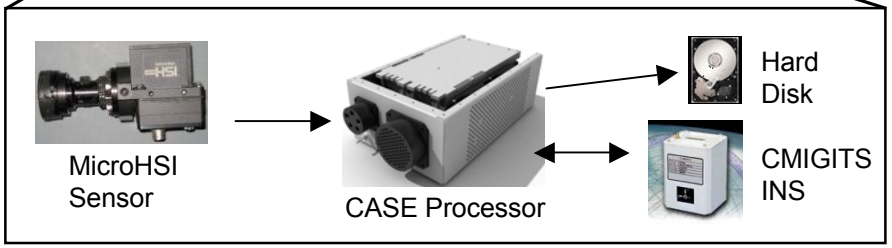
NRL CHAMP Fusion Processor
19”W x 16”D x 1.75”H

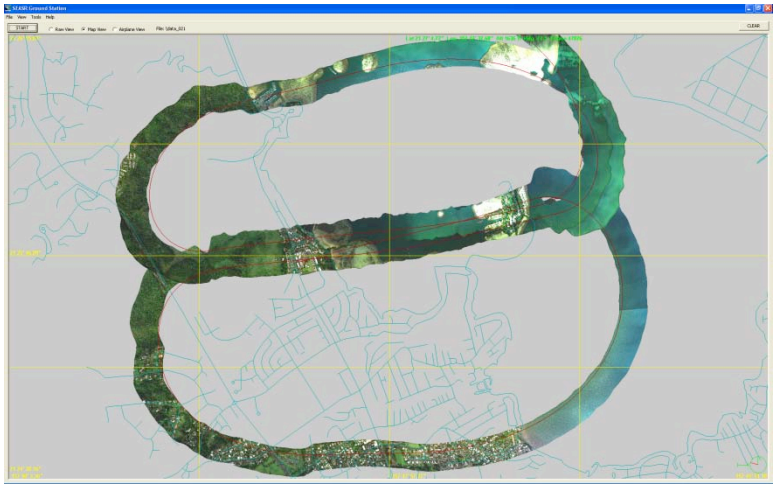


CEROS CASE Processor
7.9”W x 4.5”H x 11.6”L

COTS
FPGA
Hardware

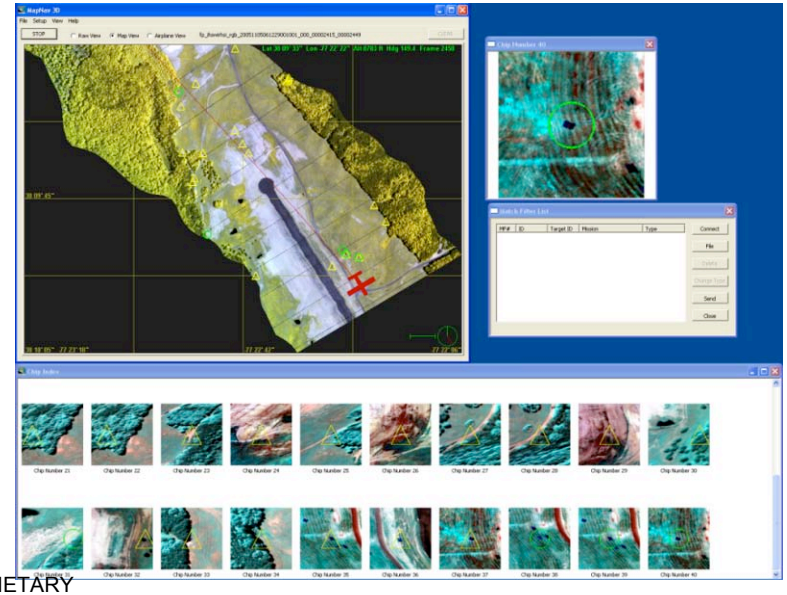
Compact Airborne Signal processing Exploitation module CASE





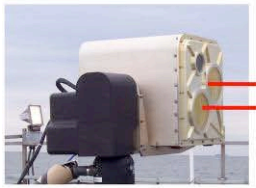
Operator interface display

Ground station display



Transmit low bandwidth chips

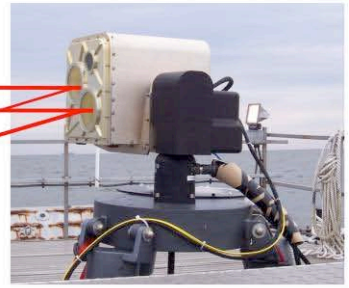
Tactical Lasercomm at NovaSol



1 Gbps (→ 2.5 Gbps)
12 miles (→ 25 miles)

Direct Mode link

Retro Mode link



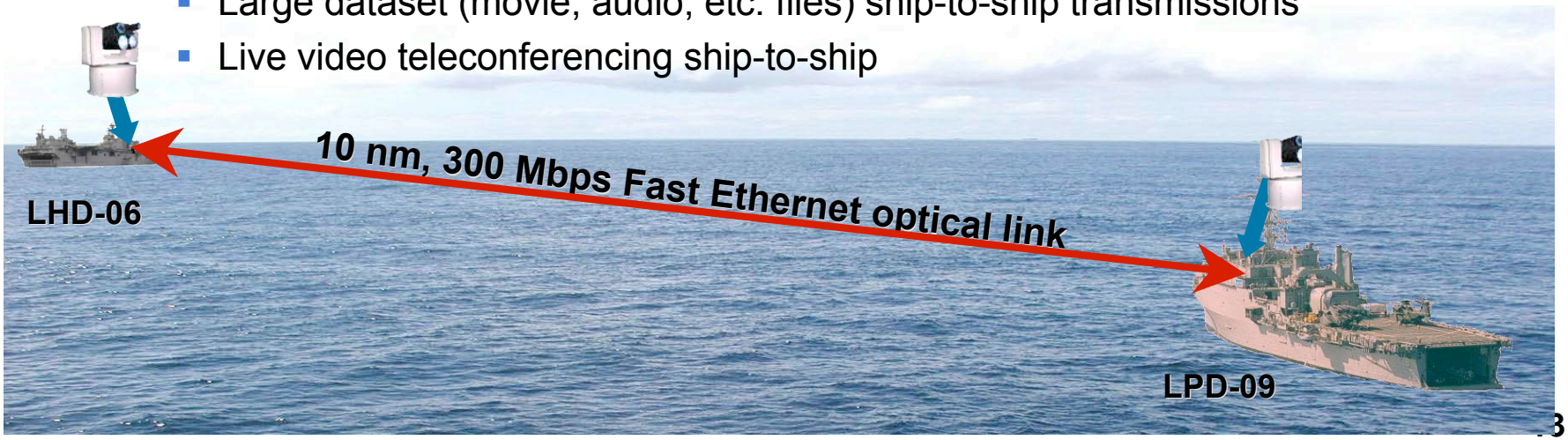
Interrogator:
10x11x12 inches 20kg

10 Mbps (→ 40 Mbps)
3 miles (→ 5 miles)

- Data transmitted on modulated laser beams
- Ultimate in low probability of detection/interception and immunity to jamming
  - Operates at 1550nm wavelength – invisible to silicon-based sensors such as night-vision goggles and image intensifiers
  - Narrow beam (5' spot @ 5 miles) gives small footprin
- Field-tested in a wide variety of configurations with both ends of the link on moving platforms

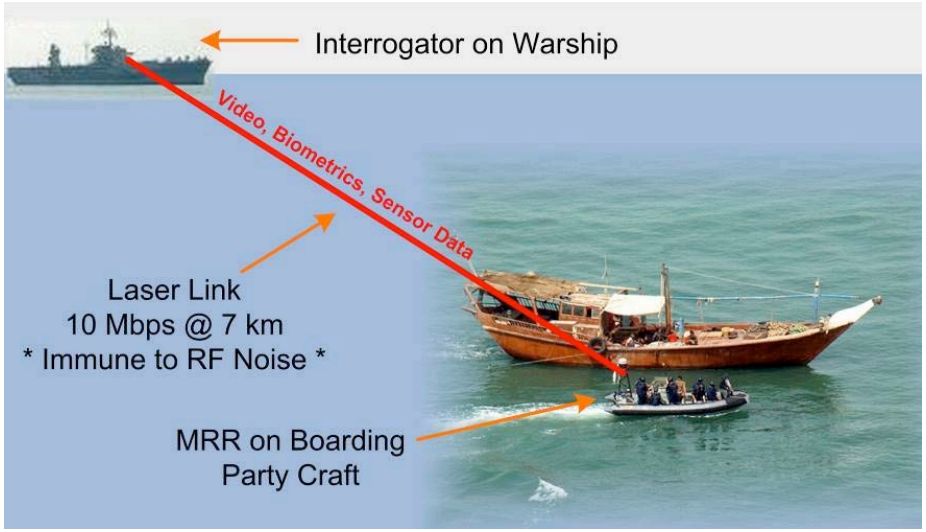
Field Demonstrations
Trident Warrior 06

- Trident Warrior 06
  - June 2006
  - Transit from San Diego to Honolulu for RIMPAC
  - Interrogators placed on two ships:
    - USS Bon Homme Richard (LHD-06)
    - USS Denver (LPD-09)
  - Demonstrate:
    - Fast Ethernet data transmission
    - Large dataset (movie, audio, etc. files) ship-to-ship transmissions
    - Live video teleconferencing ship-to-ship

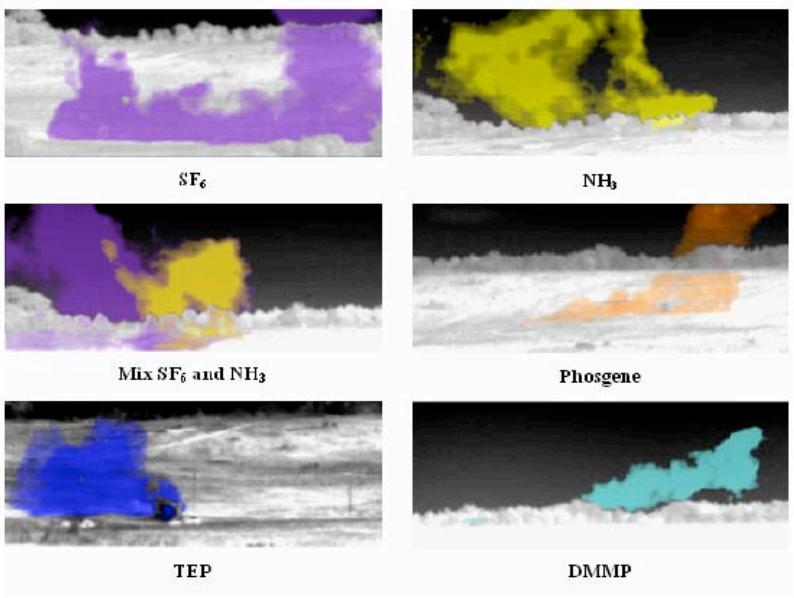


Field Demonstrations
Trident Warrior 08

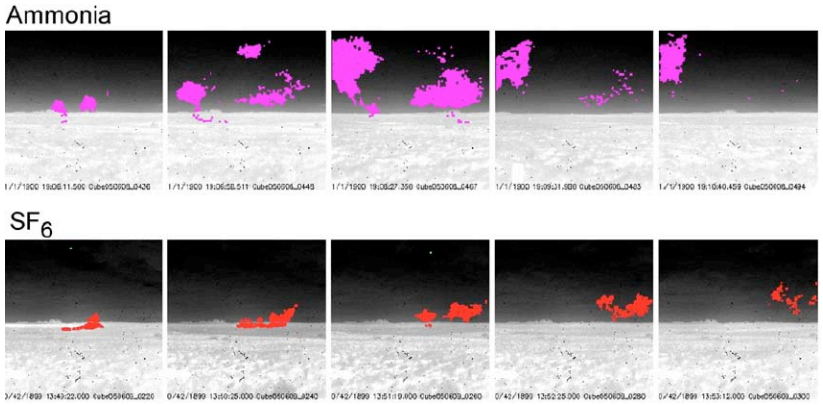
- Trident Warrior 08
  - June 2008, San Diego to Honolulu
- Retro-mode communications
  - Application: providing real-time monitoring and data reachback for boarding party teams
  - Interrogator on ship, retro on boarding party boat
  - 5 mbps transmission
    - Video
    - Biometrics data
  - Immune to ship's high RF noise levels
- Successful
  - All objectives met



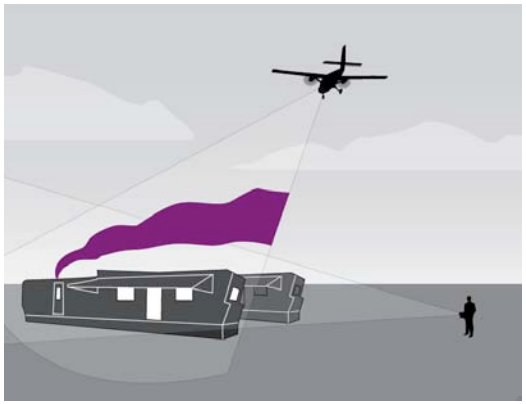
StandOff MethAmphetamine lab Detection



MWIR and LWIR HSI Standoff Chemical Plume Detections



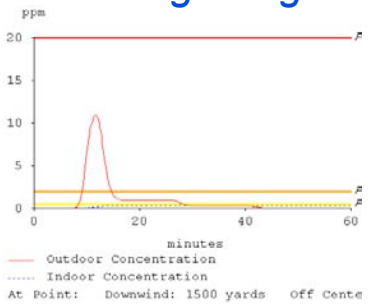
SOMAD



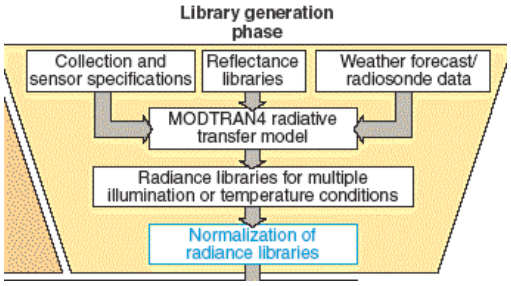
- DoD and law enforcement need Amphetamine Type Substance (ATS) detection capability
  - Stand-off detection is required
  - High spatial and temporal coverage
  - Covert real-time operation
  - Multi-platform airborne and man-portable
- Comprehensive literature/prior art search performed
  - ATS production associated with unique chemical effluents
  - Effluent plumes possess identifiable spectral signatures
- Remote sensing technology for CWA and other chemicals potentially applicable

SOMAD Approach

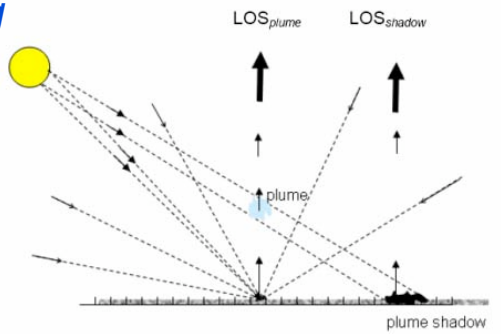
(I) Detailed Target Signature and Sensor Performance Modeling



Target Plume Propagation

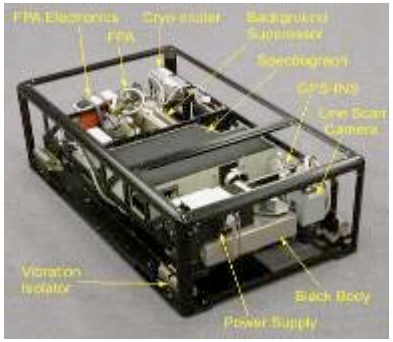


Signature Environment Conditioning



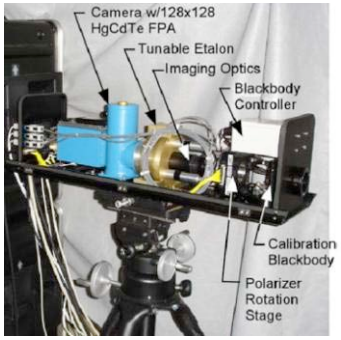
Radiance and Sensor Phenomenology

(II) Validation, Anchoring and Demonstration Breadboard Sensor Suite Testing

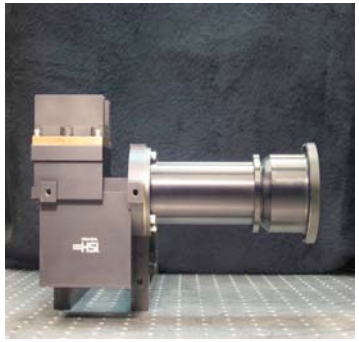


AHI Cryo-LWIR HSI

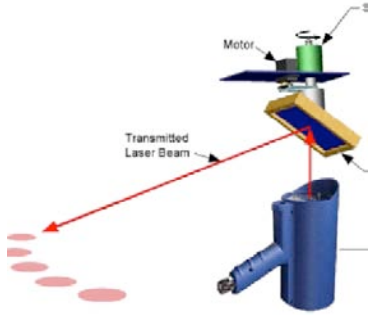
Microbolometer LWIR HSI



Prototype MWIR HSI



microSWIR HSI



Diode laser Gas Sensor

(III) Mature Requirements/CONOPS and Validated Performance Modeling Based System Design